Rejection of Claims 1, 3, 4, 5, 7 and 8 Under 35 U.S.C. § 102(b) Over U.S. Patent 4,574,102 to Arakawa *et al.*

Claims 1, 3, 4, 5, 7 and 8 have been rejected by the Examiner under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,574,102 to Arakawa *et al.* for the reasons set forth on pages 2-3 of the Office Action. This rejection is respectfully traversed. Reconsideration and withdrawal thereof are requested.

The Present Invention

The present invention as recited in claim 1 relates to a radiation image conversion panel comprising at least two phosphor layers each containing a stimulable phosphor and a binder, wherein an amount (by weight) of the binder to the stimulable phosphor in uppermost phosphor layer of the phosphor layers is greater than that of the binder to the stimulable phosphor in any other phosphor layers by at least 0.5 wt%.

The present invention displays WET on WET, that is, simultaneous coating of at least two layers, and WET on DRY, that is, coating on a dried layer, capability. As a result, the present invention has the remarkable effect of immobilizing the binder between the layers and allowing the binder/phosphor ratio to be easily controllable. A second remarkable effect of the present invention, as indicated on page 21, line 17 of the specification, is that a phosphor layer with a great filling factor can be made.

The claimed radiation image conversion panel achieves greater density of stimulable phosphor in the phosphor layer as compared to conventional radiation image conversion panels. Thus, the claimed radiation image conversion panel has reduced graininess noise without decreasing the quantity of emission light.

Other embodiments of the present invention include the different amount of binder to stimulable phosphor in the uppermost phosphor layer, the types of phosphor, thermoplastic elastomer, and binder that could be employed, and the grain size of the stimulable phosphor.

U.S. Patent 4,574,102 to Arakawa *et al.*

The description at col. 3, lines 30-50 of the Arakawa et al. reference is as follows:

> The radiation image storage panel of the present invention is enhanced in both the sharpness of an image provided thereby and the bonding strength between the support and phosphor layer as well as between the protective film and the phosphor layer, by making the mixing ratio of the binder to the stimulable phosphor inside of the phosphor layer smaller than the mixing ratio in the vicinity of the interface between the protective film and the phosphor layer (i.e., in the region of not less than 1/10 of the thickness of the phosphor layer from said interface), and smaller than the mixing ratio in the vicinity of the interface between the support and the phosphor layer (i.e., in the region of not less than 1/10 of the thickness of the phosphor layer from said interface), that is, by adjusting the distribution of the binder and the phosphor in such a manner that a larger amount of the phosphor presents sufficiently inside of the phosphor layer and a larger

amount of the binder presents in the vicinity of both interfaces thereof.

The description at col. 7, lines 60-66 of the Arakawa et al. reference is as follows:

> The mixing ratio of the binder to the stimulable phosphor in each coating dispersion can be determined according to the characteristics of the aimed radiation image storage panel and the nature of the phosphor employed. Generally, the ratio is within the range of from 1:1 to 1:100 (binder:phosphor, by weight), preferably from 1:8 to 1:50.

Arakawa et al. Does Not Disclose That The Binder To Phosphor Ratio Is Highest In Only The Uppermost Portion Of The Layer

Column 3, lines 30-50 of the Arakawa et al. reference discloses a phosphor layer with a raised binder to phosphor ratio in the uppermost and lowermost portions in order to secure the bonding strength between the protective film and the support. Further, column 4, lines 6-20 of the Arakawa et al. reference teaches that it is preferable to have the highest binder to phosphor ratio in the lowermost portion, thereby teaching away from the present invention.

Accordingly, contrary to the position taken by the Examiner, the Arakawa et al. reference does not disclose that the binder to phosphor ratio is highest in only the uppermost portion of the layer. Therefore, the invention of claim 1 of the present application is novel.

Furthermore, the 1:8 to 1:50 value disclosed in column 7, lines 60-66 of the Arakawa et al. reference is taught as a preferable binder/phosphor ratio of the individual coating composition. This disclosure does not mean that portions possessing the 1:8 and 1:50 ratios actually exist in the phosphor layer. Accordingly, the Examiner should withdraw the rejection because the above-described values and the value (1:8 - 1:50 =) 10.5 wt % are completely unrelated to the novelty of claim 1 of the present application.

Comparative Examples 1, 4, and 7 of Arakawa et al.

Comparative examples 1, 4, and 7 of Arakawa et al. teach that the binder/phosphor ratio of the uppermost portion of the layer is indeed greater. However, the distribution of the binder/phosphor ratio is successive. In contrast, claim 1 of the present invention recites that the radiation image conversion panel comprises at least two phosphor layers. The binder/phosphor ratio in the present invention is not successive. Clearly, the structure of the present invention differs from the comparative examples 1, 4, and 7 of Arakawa et al. and is thus novel.

Additionally, as indicated in the paragraph bridging pages 7-8 of the specification, the present invention thus configured allows for easy adjustment according to the desired characteristics of the radiation image conversion panel. This special characteristic of

the present invention is not obvious over the Arakawa et al. reference. See claims 10-13.

Arakawa et al. Does Not Teach A Method That Can Make The Present Invention

The manufacturing method for making the radiation image conversion panel of the Arakawa et al. reference makes it impossible to create two or more phosphor layers as required in claim 1 of the present invention. Further, there is no teaching or suggestion whatsoever of a phosphor layer as described in the present invention. In addition, the invention in Arakawa et al. seeks to enhance sharpness and bonding strength, whereas the present invention deals with graininess and quantity of light emission. The Arakawa et al. reference does not disclose or suggest the objectives of the present application. Thus, the two inventions are completely different.

In view of the remarks hereinabove, reconsideration and withdrawal of the rejection of claims 1, 3, 4, 5, 7 and 8 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,574,102 to Arakawa *et al.* are respectfully requested.

Rejection of Claim 6 under 35 U.S.C. § 103(a) Over Arakawa et al. In View of Dooms et al.

Claim 6 is rejected by the Examiner under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent Number 4,574,102 to Arakawa et al. in view of U.S. Patent Number 5,789,021 to Dooms et al. for the reasons set forth on pages 3-5 of the Office Action. This rejection is respectfully traversed. Reconsideration and withdrawal thereof are requested.

The Present Invention

The present invention as recited in claim 6 relates to a radiation image conversion panel comprising at least two phosphor layers each containing a stimulable phosphor and a binder, wherein an amount (by weight) of the binder to the stimulable phosphor in uppermost phosphor layer of the phosphor layers is greater than that of the binder to the stimulable phosphor in any other phosphor layers by at least 0.5 wt%, wherein the stimulable phosphor has a grain size ranging from 1 to 15 μm.

The Arakawa et al. Reference

The above-mentioned comments with respect to the Arakawa et al. reference are herein incorporated by reference.

The Dooms et al. Reference

The description at col. 5, line 63 - col. 6, line 7 of the Dooms et al. reference is as follows:

> Said one or more phosphor layers may have the same or a different layer thickness and/or a different weight ratio amount of pigment to binder and/or a different phosphor particle size or particle size distribution. It is general knowledge that sharper images with less noise are obtained with phosphor particles of smaller mean particle size, but light emission efficiency declines with decreasing particle size. Thus, the optimum mean particle size for a given application is a compromise between imaging speed and image sharpness desired. Preferred average grain sizes of the phosphor particles are in the range of 2 to 30 μm and more preferably in the range of 2 to 20μm.

Distinctions over the Combination of Arakawa et al. in view of Dooms et al.

Dependent claim 6 is allowable for the same reasons as independent claim 1. Moreover, the Examiner's reliance on the Dooms et al. reference does not correct for the deficiencies of the primary Arakawa et al. reference discussed above. Thus, the rejection of claim 6 under 35 U.S.C. 103(a) should be withdrawn by the Examiner.

As mentioned above, the present invention employs an amount of the binder to the stimulable phosphor in the uppermost phosphor layer of the phosphor layers to be greater than that of the binder to the stimulable phosphor in any of the other phosphor layers by at least 0.5 wt%. This feature is not disclosed or suggested in either the Dooms et al. or the Arakawa references. Thus, the

asserted combination instantly fails to establish a *prima facie* case of obviousness.

In addition, the feature of changing the amount of binder to the stimulable phospohor so that there is a difference in amount in the uppermost phosphor layer compared to the other phosphor layers is a feature patentably distinguishable from the asserted combination of references. Applicant respectfully submits that such a feature is not mere optimization, but patentably distinguishable over the cited references.

Further, nothing in the Dooms et al. or in the Arakawa et al. references even suggests changing the amount of the binder to the stimulable phosphor in uppermost phosphor layer of the phosphor layers to be greater than that of the binder to the stimulable phosphor in any other phosphor layer by at least 0.5 wt%, or by 1 to 100 wt%. Thus, the asserted combination of the Dooms et al. and the Arakawa et al. references is still deficient in not reciting all of the claimed features of claim 6.

As stated in the specification, Applicant has focused on how the phosphor layer is divided into two or more layers having different characteristics (page 5, lines 3-5). By employing the difference in amount of binder in the uppermost phosphor layer compared to the other phosphor layers, Applicant has achieved a desirable radiation image conversion panel having reduced graininess noise without decreasing the quantity of emission light.

These desirable characteristics and unexpected advantages such as improved S/N ratio of the present invention are also not disclosed by the cited Dooms et al. and Arakawa et al. references.

Thus, the asserted combination of references does not provide the requisite motivation and reasonable expectation of success that one having ordinary skill in the art would need to achieve the present invention. Moreover, the cited references do not disclose or suggest the unexpected results of the present invention.

In other words, the other requirements for a *prima facie* case of obviousness have not been satisfied because one skilled in the art would not be motivated or reasonably expect to be successful by combining the Dooms et al. reference with the Arakawa et al. reference in achieving "an amount (by weight) of the binder to the stimulable phosphor in uppermost phosphor layer of the phosphor layers is greater than that of the binder to the stimulable phosphor in any other phosphor layers by at least 0.5 wt%" as instantly claimed. This is because one skilled in the art would not reasonably expect to be successful, or be motivated, in achieving advantages such as simultaneous optimum quantity of emission light and a high-level graininess due to the claimed radiation image conversion panel. There is no disclosure in the Dooms et al. or Arakawa et al. references of such advantages of the present invention.

The USPTO has, therefore, relied on an impermissible level of

"hindsight reconstruction" as a basis of support of the instant rejection. Thus, Applicant respectfully submits that all requirements for a *prima facie* case of obviousness have not been satisfied, and that impermissible, substantial hindsight reconstruction is the only way to achieve the present invention and its advantages.

Existence of Unexpected Results Rebut a *Prima Facie* Case of Obviousness

With regard to the Rule 132 Declaration (filed with the Amendment of August 6, 2002), the Examiner has not clearly stated which features are being argued but not recited in the claims (see the Office Action at page 5). The Examiner is respectfully requested to clarify this point in an interview, if necessary, prior to issuance of a final Office Action in order for Applicant to determine if the claims should be amended prior to issuance of the next Office Action.

Applicant respectfully submits that the present invention has achieved unexpected results, where such unexpected results rebut any asserted *prima facie* case of obviousness. As can be seen from Table 1 at page 25 of the specification, the graininess noise can be reduced by a multi-layered phosphor layer having a larger amount of binder contained in the upper-layer phosphor layer.

For example, Example 1 of the present invention has 100% light emission quantity. Example 1 has an amount (by weight) of the binder to the stimulable phosphor in the uppermost phosphor layer of the phosphor layers which is greater than that of the binder to the stimulable phosphor in the lower phosphor layer by at least 0.5 wt% (as recited in claim 6). Simultaneously, there is no decrease in the quantity of light emitted from a phosphor. Thus, the present invention has produced a radiation image conversion panel having a desirable signal-to-noise ratio.

In contrast, Comparative Examples 1 and 2 do not increase the amount of binder contained in the upper-layer phosphor layer (also shown in Table 1), resulting in inferior graininess noise (*i.e.*, 0.35×10^{-2}, versus 0.27×10^{-2} for Example 1 of the present invention).

Applicant submits that there is additional unexpected results that rebuts any asserted *prima facie* case of obviousness with regard to the combination of the Dooms et al. and Arakawa et al. references.

When the thickness of the single-layered phosphor disclosed by the Arakawa et al. reference is increased to correspond to the total thickness of Example 1 of the present invention, the present invention still achieves an unexpectedly higher emission quantity and an unexpectedly lower graininess noise. See the Declaration under 37 C.F.R. § 1.132 of record.

In the Rule 132 Declaration, Table 2 shows that Example 1 of the present invention has unexpectedly higher emission quantity and lower graininess noise over the Comparative Example 3 (wherein Comparative Example 3 corresponds to the phosphor of the Arakawa et al. reference). Thus, by increasing the amount of a binder contained in the upper-layer of the phosphor sheet, the present invention has reduced graininess noise without decreasing the quantity of light emitted from the phosphor. Such unexpected results of the present invention are not observed in the single-layered phosphor of the Arakawa et al. reference.

Accordingly, Applicant respectfully submits that the present invention incorporates subject matter that is patentably distinguishable from the asserted combination of the Dooms et al. and Arakawa et al. references. Thus, Applicant respectfully requests the Examiner to reconsider and to withdraw the rejection and allow the currently pending claims.

A full and complete response has been made to the Office Action. The Examiner is respectfully requested to pass the application to issue.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Attached hereto is a marked-up version of the changes made to the application by this Amendment.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: Version with Markings to Show Changes Made

(Rev. 02/20/02)

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 9-13 have been added.